Future Of Transportation…

Its Electrifying!

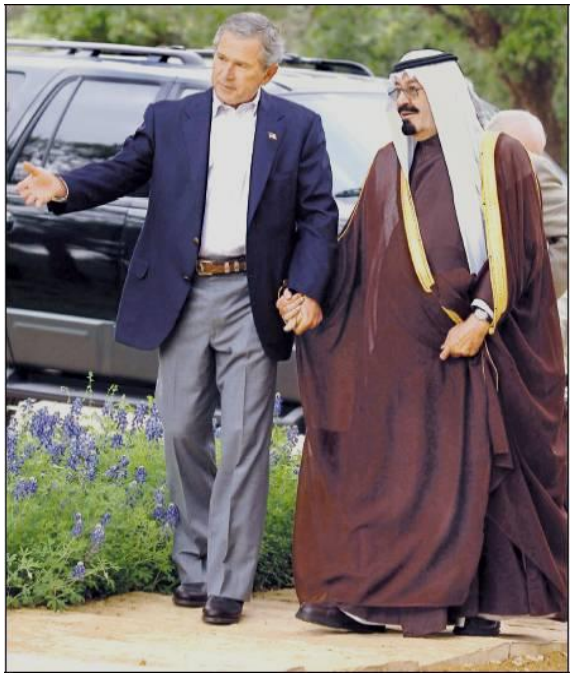
Ed Kjaer

Director Electric Transportation

SOUTHERN CALIFORNIA EDISON®
An EDISON INTERNATIONAL® Company

Oil…Its In The "Driver's" Seat

US "oil addiction"
60+ % imported
China & India
Middle East volatility



Resulting in
$75 barrel… $100 by ?
$3+ @ pump…
$4+ by ?

…Are we too reliant?

Driving down SUV Sales

- **SUV Sales Decline (first 6 mths)**

	% Chge
• Ford Explorer	-29.0
• Chevrolet Trailblazer	-22.3
• Jeep Cherokee	-32.2
• Toyota 4Runner	5.4
• Dodge Durango	-37.5
• Nissan Pathfinder	0.1

- **Top 10 Sellers (first 6 mnths)**

	Units
1. Ford F series	400,177
2. Chev. Silverado	317,169
3. Toyota Camry	218,517
4. Dodge Ram	183,174
5. Honda Accord	178,116
6. Honda Civic	165,056
7. Chev. Impala	144,730
8. Toyota Corolla	132,182
9. Dodge Caravan	125,813
10. Chev. Cobalt	119,952

Source: Automotive News July 10 2006

Driving Down SUV Sales

- January- a new Tahoe SUV- av. 7 days on lot and av. transaction price = $42,191
- Today same Tahoe SUV- av. 62 days on lot and av. Transaction price = $37,667

source: Automotive News August 7

- *Consumers are moving away from SUVs to smaller cars in what he characterizes as a "tectonic shift".*

Source: Mark Fields, Ford

Driving Up Fuel Economy Advertising

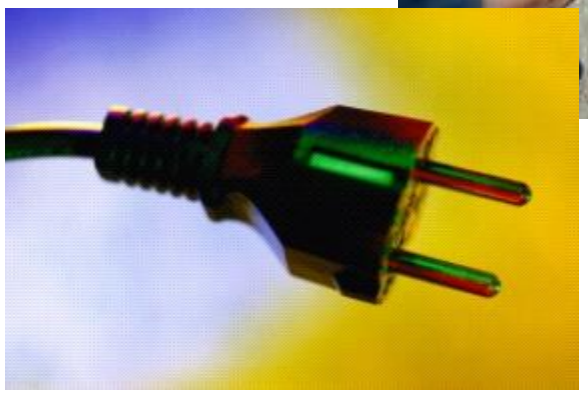
And Going Green…

Research shows that 70% of Americans are now "very concerned" with the environment and that fuel efficiency is one of three most important factors in influencing people's choice of cars. Source: Ford

Celebrity Endorsements!

And Waving the Flag!

Oil's Driving Growth of Alternative Fuels



Growing call for domestic alternative fuel
Recognizing electricity as an alt. fuel

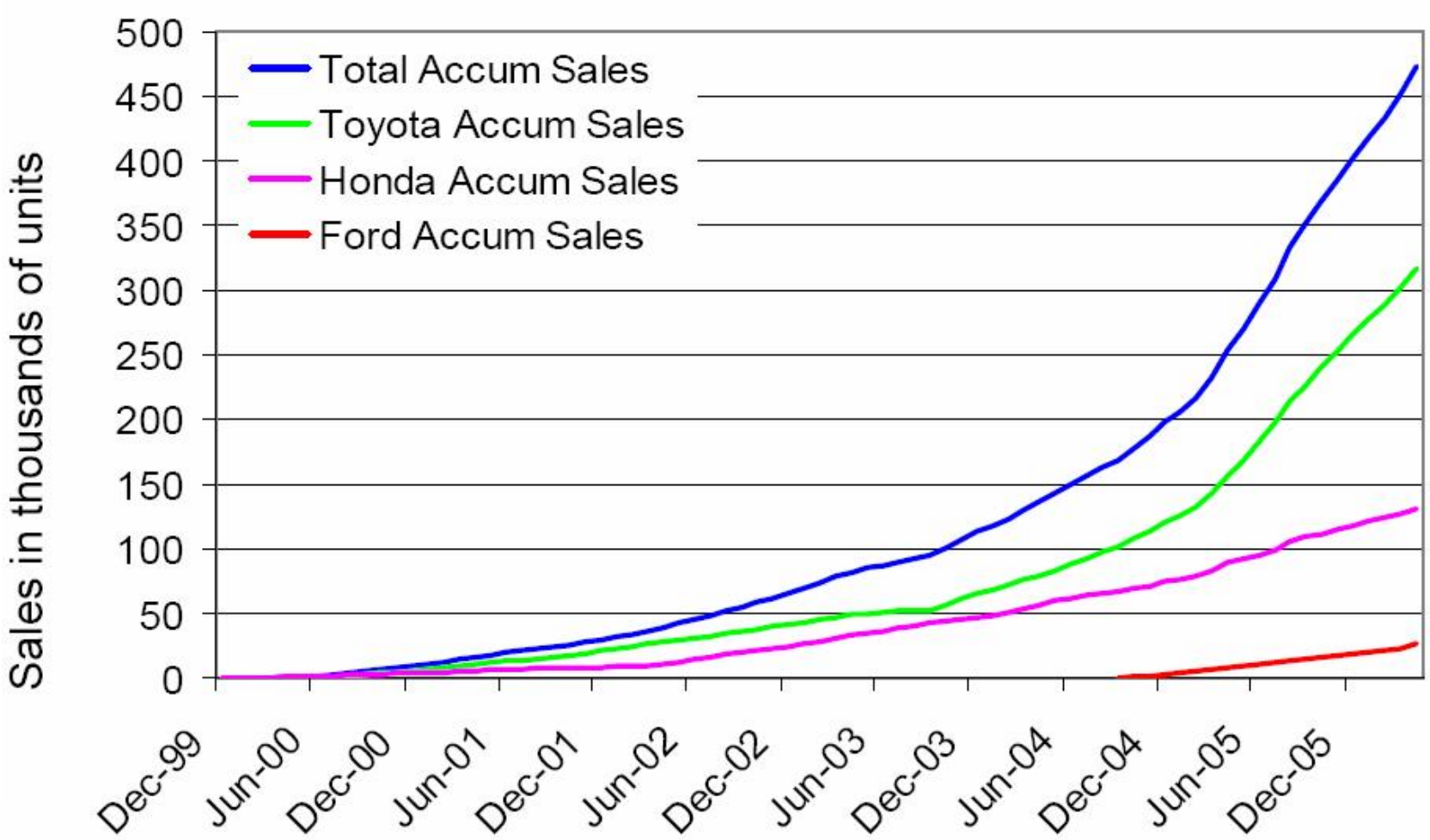
But The Real News Is Hybrids

- Honda Insight - 12/99
- Toyota Prius - 7/00 (12/97 Japan)
- Honda Civic Hybrid - 4/02
- Next Generation Prius - 10/03
- Ford Escape Hybrid - 09/04 ; Mariner - 11/05 ; Tribute - ?
- Honda Accord HV - 12/04
- Lexus RX 400h - 04/05
- Toyota Highlander HV - 06/05
- Lexus GS 450h - 05/06
- Camry Hybrid - 05/06
- Saturn VUE 42V BAS - 06 CY ; Saturn Aura BAS - 07 CY
- Nissan Altima - late 06 CY or early 07
- Lexus LS 600h L - 07 CY
- Fusion/Milan - 07 CY ?
- GM Dual Mode SUVs - Late 07 ; DCx/BMW SUVs - 08CY

TOYOTA

Source: Toyota

Global Hybrid Sales



Source: Toyota

Toyota Hybrid Leadership

- ***"I truly believe Toyota CAN BE part of the solution to the great issues of our times... issues like energy independence...air pollution...health care...safety...and global warming."***

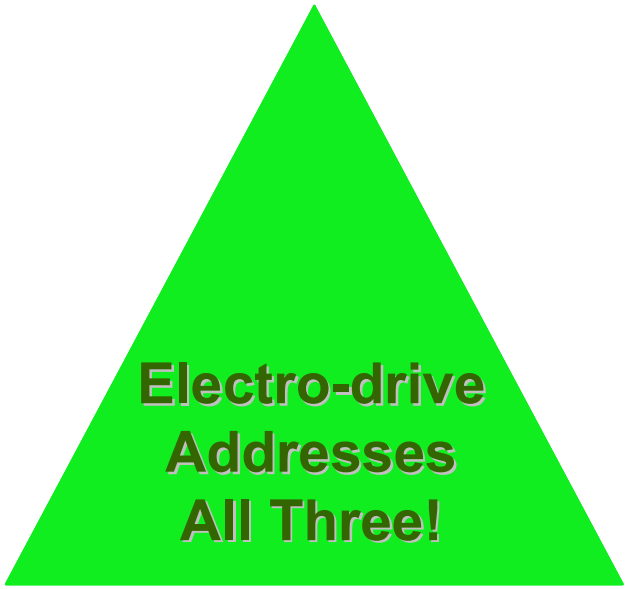
- ***"Hybrid technology can be teamed with every other promising technology to make it even more efficient and fuel-stingy...whether its high-tech gas engines...clean diesels...bio-diesel...ethanol...plug-in hybrids...or hydrogen fuel cells."***

- ***"At Toyota, alone, we're spending an average of $22.7 million PER DAY on research and development."***

Jim Press, Pres. Toyota North America

Its More Than Just The Oil…
Its About Sustainability

Petroleum Reduction/ Diversity
95% one fuel, 60% Imported

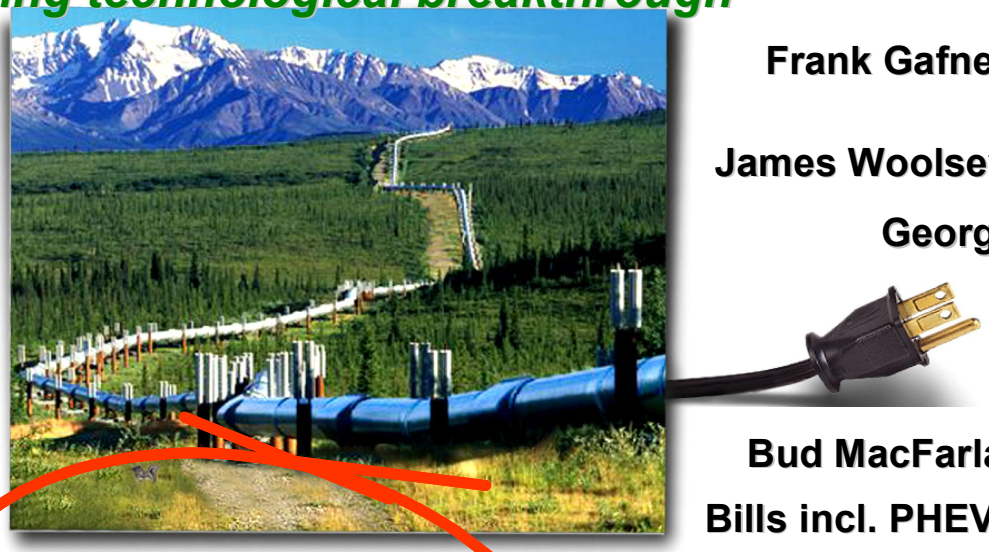


Air Pollution Reduction
Largest Source; 65% of all Criteria Pollutants

Global Warming Reduction
Largest Source From Transportation; Over 40% in Ca.

Which is Driving A PHEV National Movement-

President Bush on Plug-In-Hybrids
"*amazing technological breakthrough*"



Next gen. Toyota Prius w/ plug?

"Plug In America" **"Set America Free"**

Frank Gafney **Alliance To Save Energy**

James Woolsey **Pataki** ***State-of-The-State***

George Shultz

NRDC ***Robert F Kennedy Jr***

Pluginpartners.org

Bud MacFarlane

Bills incl. PHEVs

Alan Greenspan

EPRI

DaimlerChrysler- *Sprinter Van*

•Ford-
•Toyota
•Hyundai
Discussions

Mitsubishi

GM- "Looking at PHEVs"

DOE **Calcars.org** **Plug-In-Hybrid Consortium**

"National Commission on Energy Policy"

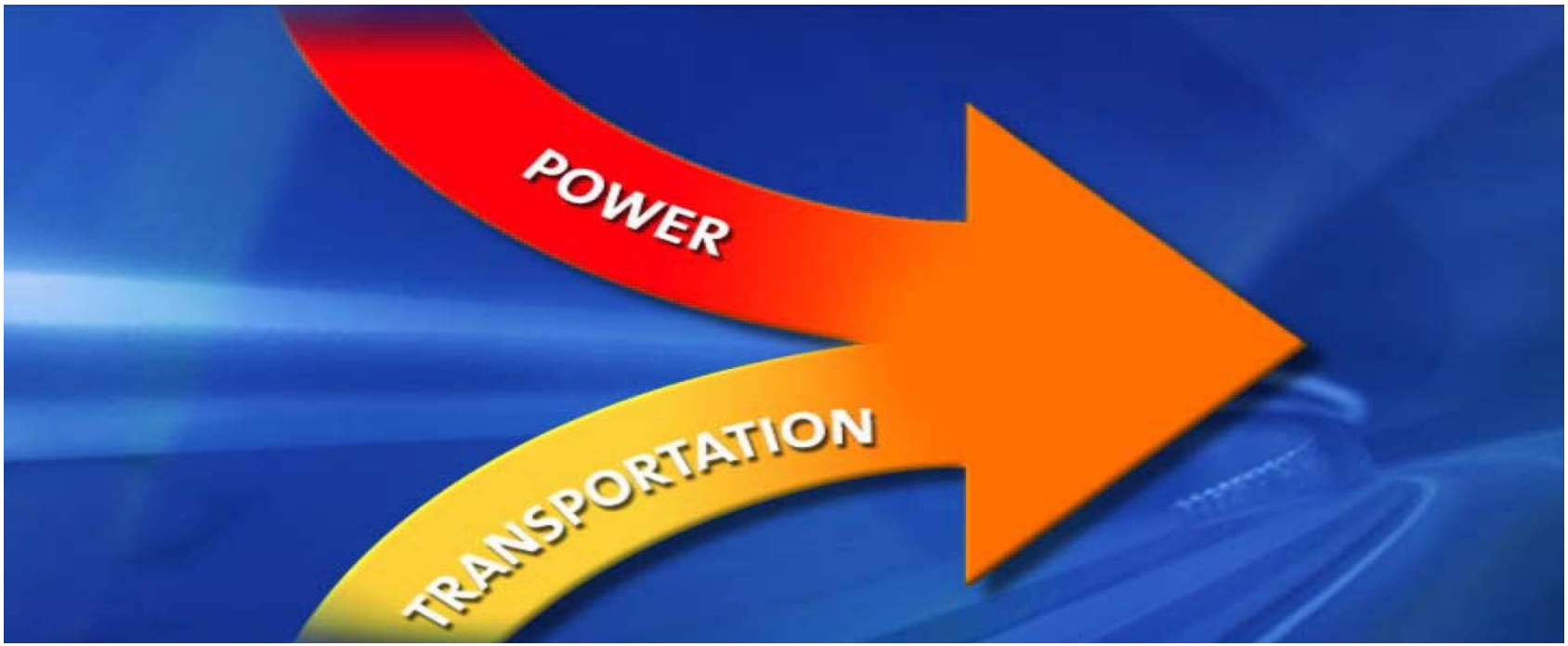
Battery Advances **CARB and CEC studies**

LA Times, NY Times, Time Magazine, Business Week, IEEE Spectrum, Wall Street Journal, USA Today, Wired, Associated Press, Reuters, ABC, NBC, CBS, CNN, PBS, NPR and many more.

Including The Auto “Ecoist”

Today’s auto “Ecoist” v 60’s “enthusiast” (mpg v speed)

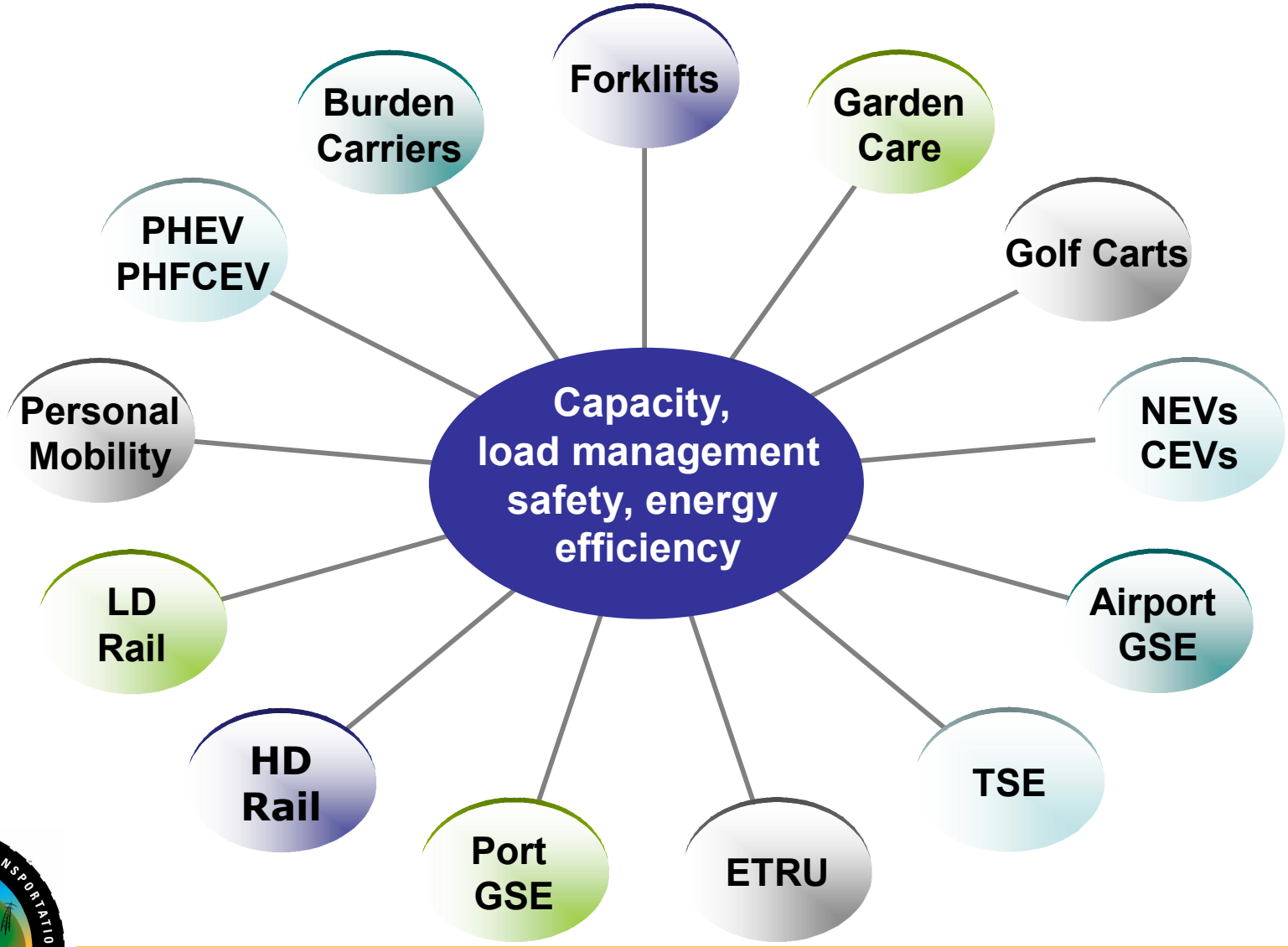
…Part Of A Fundamental Convergence



Increasingly Transportation Is Becoming "Electricity" Powered

Hybrid vehicles today; Plug-in-Hybrids and fuel cell vehicles tomorrow
Electrification at marine ports, truck facilities, airports, and rail yards
Electric goods movement equipment

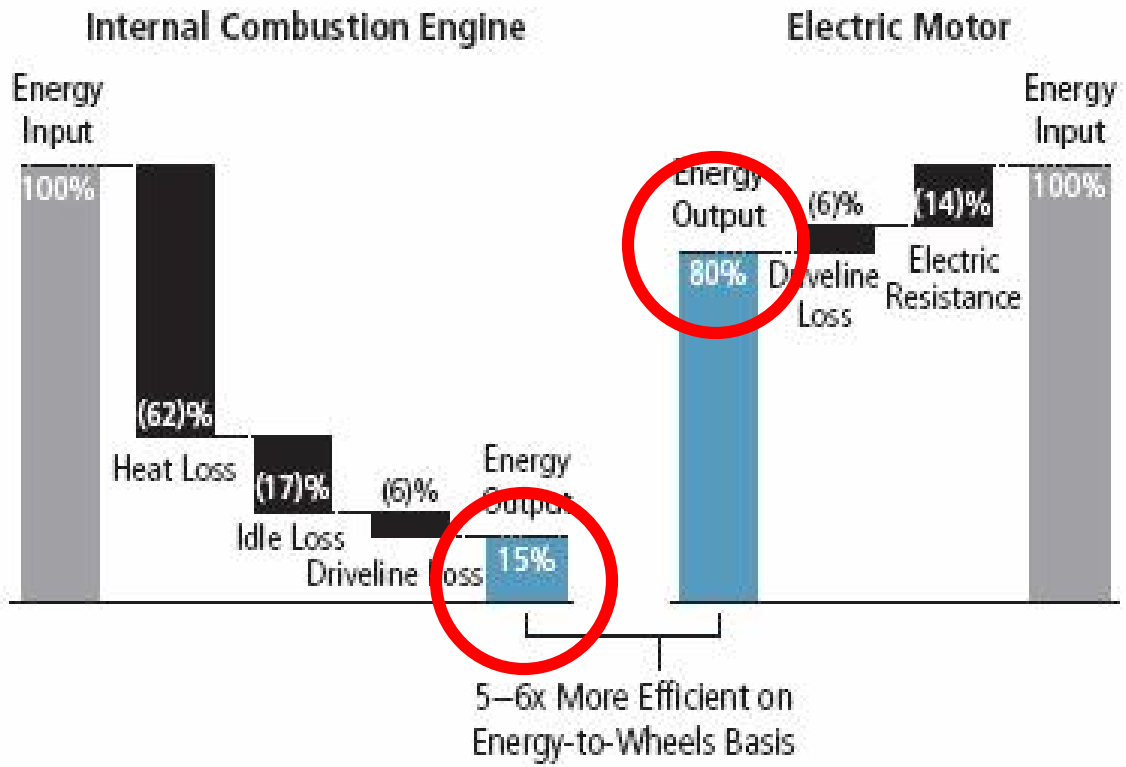
…And Bigger Than Just Our Cars



Increasingly We're using "Electricity" For Efficiency

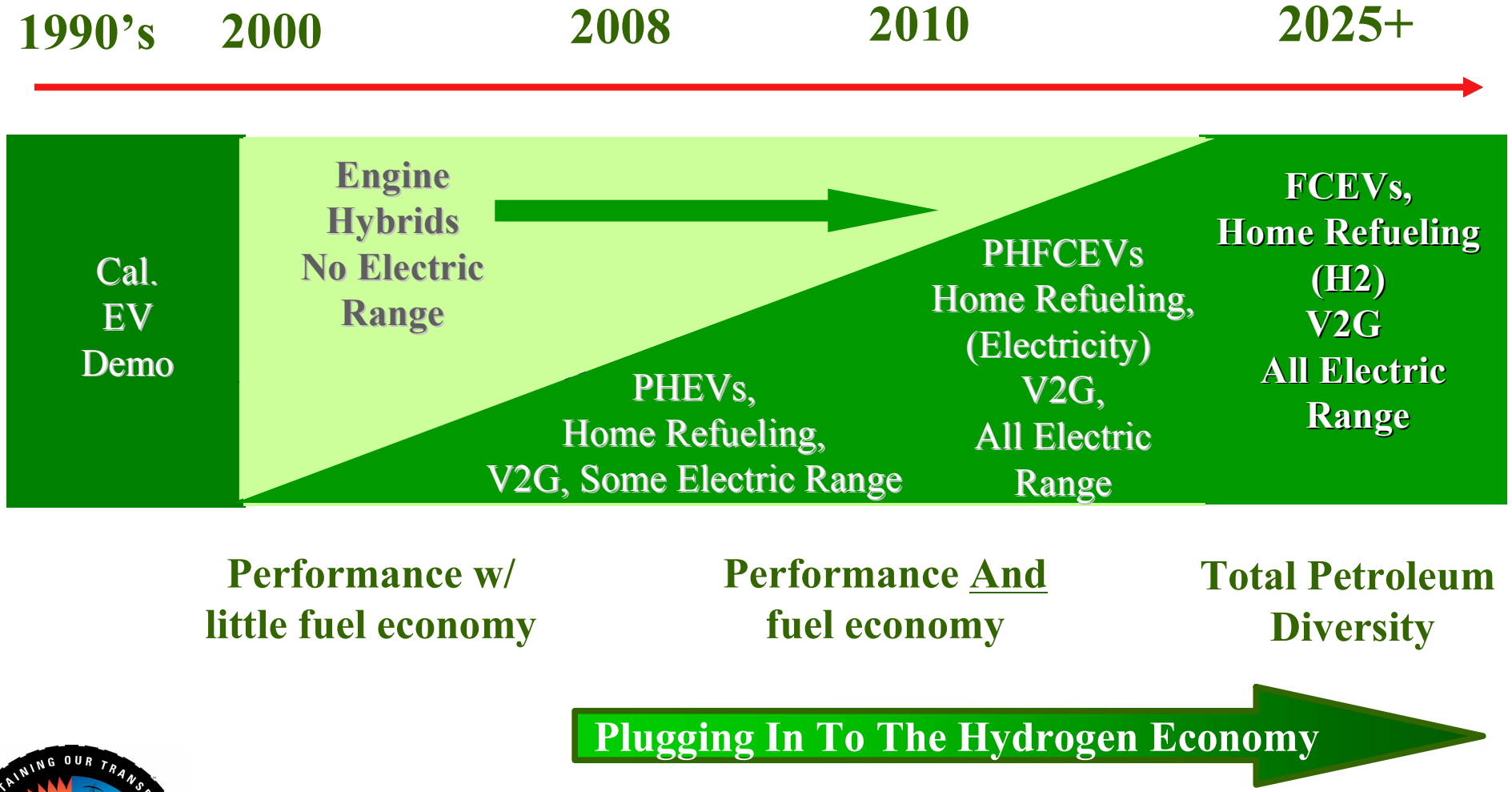
Display 14

Electricity Is Far More Efficient Way to Power Cars



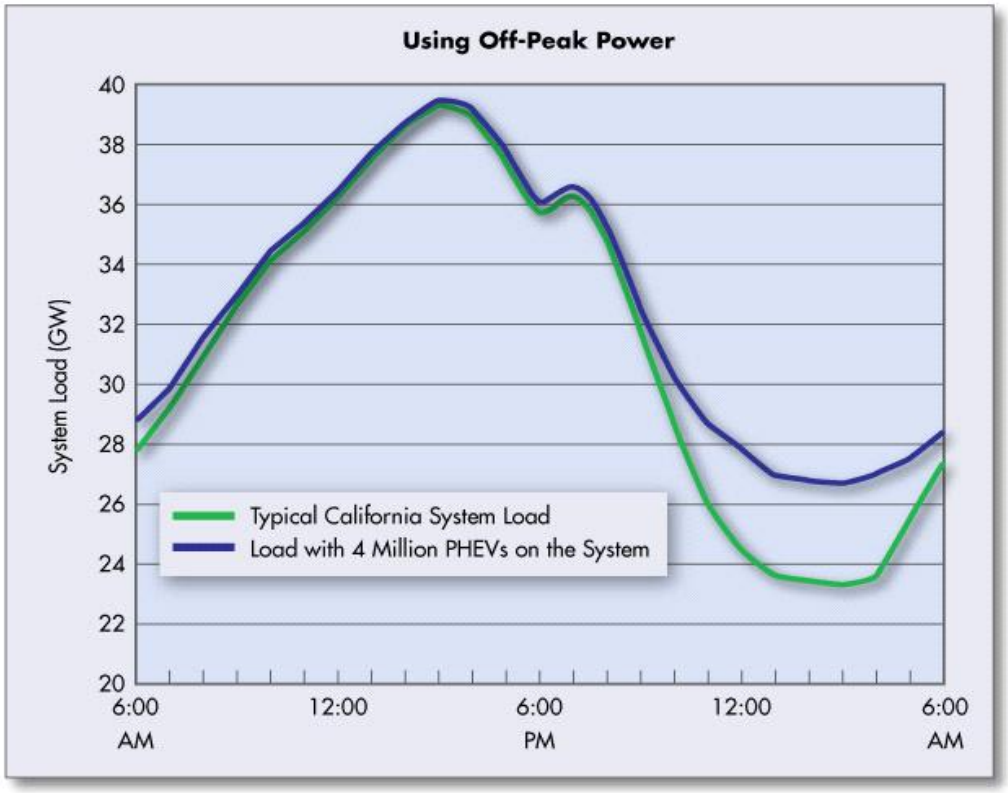
ICE → HEV → PHEV → BEV/FCEV

Plugging In To Our Future



Benefiting From The Grid

- Domestic, petroleum free, multiple feed stocks
- Excess off-peak capacity
- 20 – 30 % cost of petroleum (gge)
- Reduces urban air pollution (ZEV miles)
- Generation only getting cleaner over time (regulations, technology)

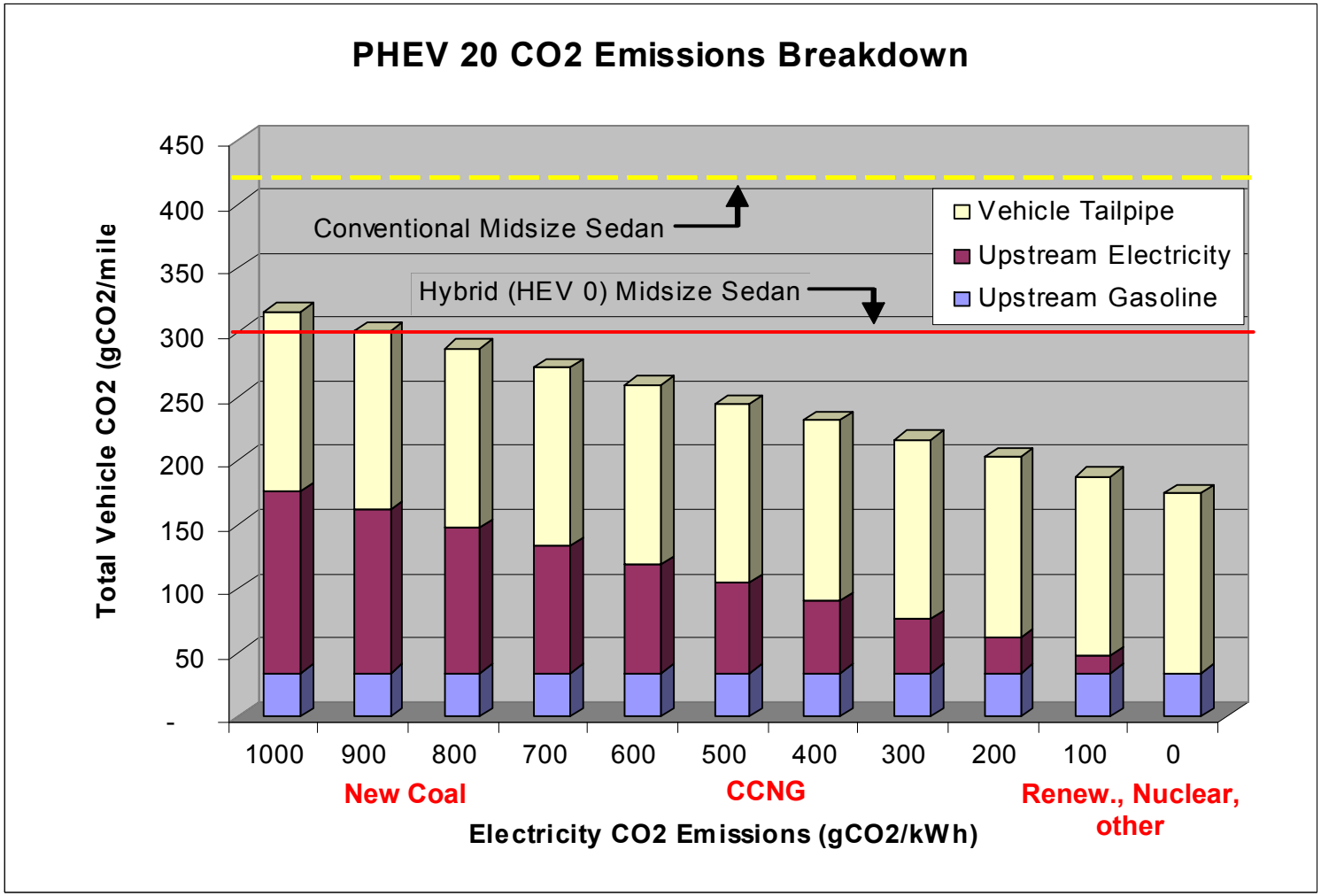


Source EPRI

Grid Versus Gasoline "Electricity"

- Compared to best in class HEV today a PHEV 20–40 could deliver-
  - *35% - 50% reduction in NOx and ROG*
  - *45% - 65% reduction in petroleum*
  - *30% - 45% reduction in greenhouse gases*
- Flex-Fuel PHEVs:
  - *Cellulosic ethanol PHEVs approach petroleum-free, "zero-carbon"*
  - *Beneficial "pairing": plug in for local urban miles, cellulosic E85 for range extension fuel*

Grid Electricity- CO2 "Well to Wheels"



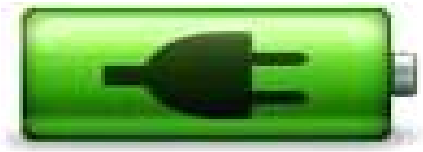
CA – average = 250 – 300 grams per kWh

CA - marginal today = 330 grams per kWh and US in 2050

CA in 2050 = about 150 grams per kWh

State Of PHEV Technology

- Most Autos have hybrid programs today
- Tomorrow's PHEVs basically same as today's hybrids w/ larger battery and plug (higher cost)
- Toyota "pursuing" PHEV technology (Gen III Prius a PHEV?)
- Other OEMs including Ford, DaimlerChrysler and GM working on them?
- Batteries (NiMH and Li) have come a long way from '90's (SCE EV experience)
- SCE bench testing PHEV battery modules now. Technology is "maturing" but cost remains a challenge
- Energy batteries needed for mobile and stationary "systems"



…And Automaker Response?

- "Today, we are pursuing a "plug-in" hybrid vehicle that can travel greater distances without using its gas engine...conserving more oil AND slicing smog and greenhouse gases to nearly imperceptible levels." *Toyota*
- "We are very keenly looking at it and working with that technology." *Bill Ford*
- "General Motors, losing sales to fuel-efficient cars from Toyota Motor, is developing a hybrid- electric vehicle with a battery that recharges at any outlet, *GM* executives familiar with the plan said"

SCE Leadership

- 90's Edison EV built California's EV charging
- Today SCE has largest EV fleet nationally
- Evaluating nation's first PHEV prototype
- 2003 built first "proof- of-concept" heavy duty PHEV utility boom truck
- Leading new utility/EPRI PHEV medium duty utility boom truck program
- Operate nationally renowned EV Technology Center
- Constructing hydrogen fueling test station at Rosemead

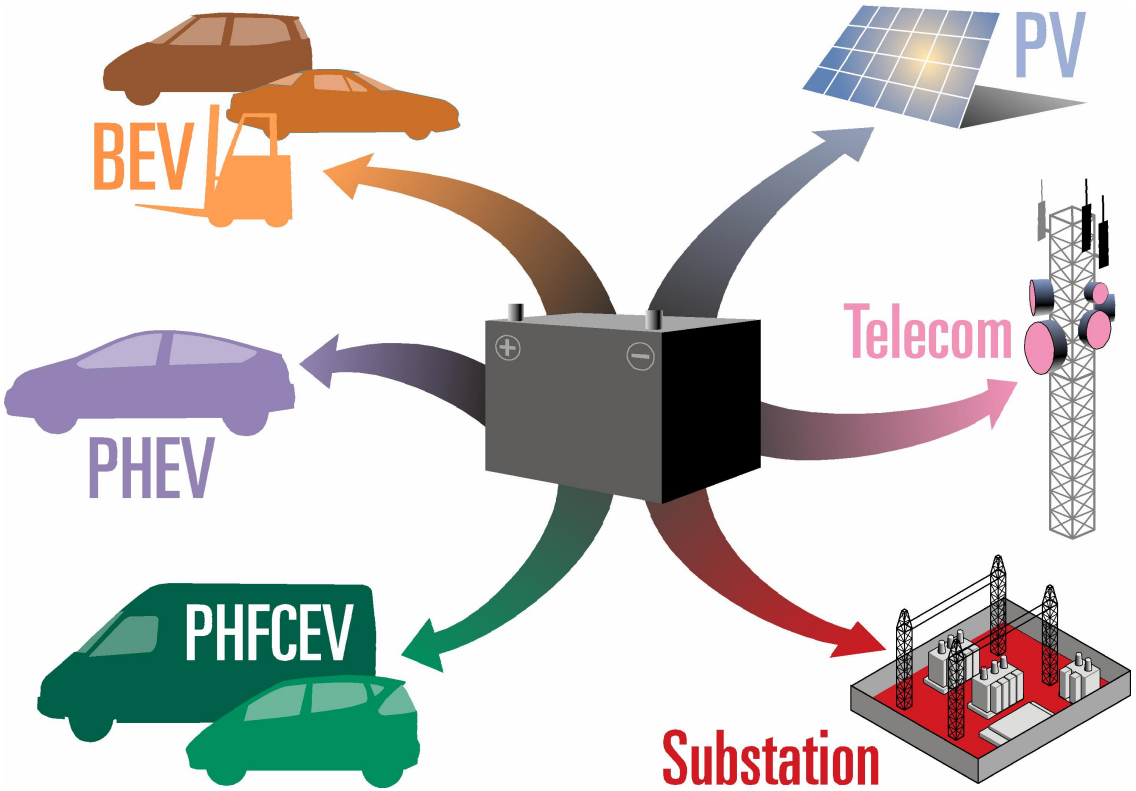
SCE Leadership- Hydrogen

- Partnering w/Chevron Hyundai & DOE
- Five year program
- Breaking ground July
- Commissioning 12/06
- Up to 10 Hyundai FCEVs
- Future PV addition

SCE's Leadership- EV Technical Center (EVTC)

- Established in 1993
- Recognized by U.S. Department of Energy
- ISO 9001:2000 Certified
- Known for quality services

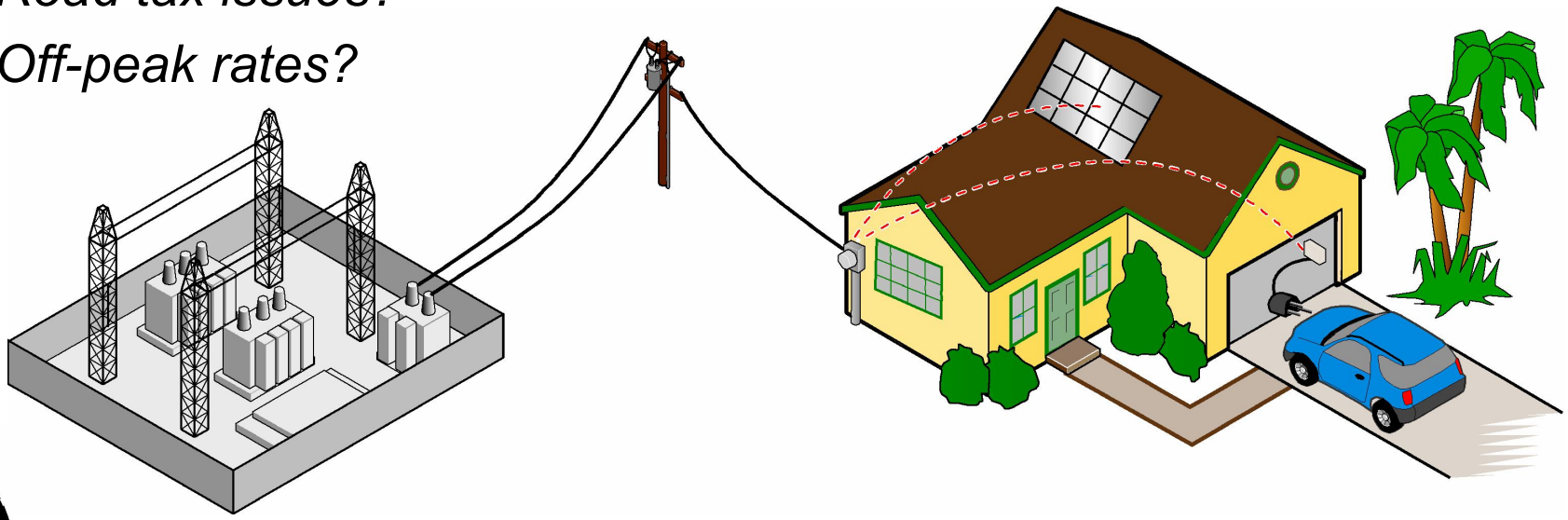
SCE's Vision- Near Term Energy Batteries



- Integral to "Energy System" of future (mobile & stationary)
- Address incumbent shortcomings (size, weight, thermal management, maintenance etc)
- Remote monitoring/ communication capabilities
- "Power" batteries today exceed performance/life expectations
- "Energy" battery challenges (PHEV duty cycle, calendar life)

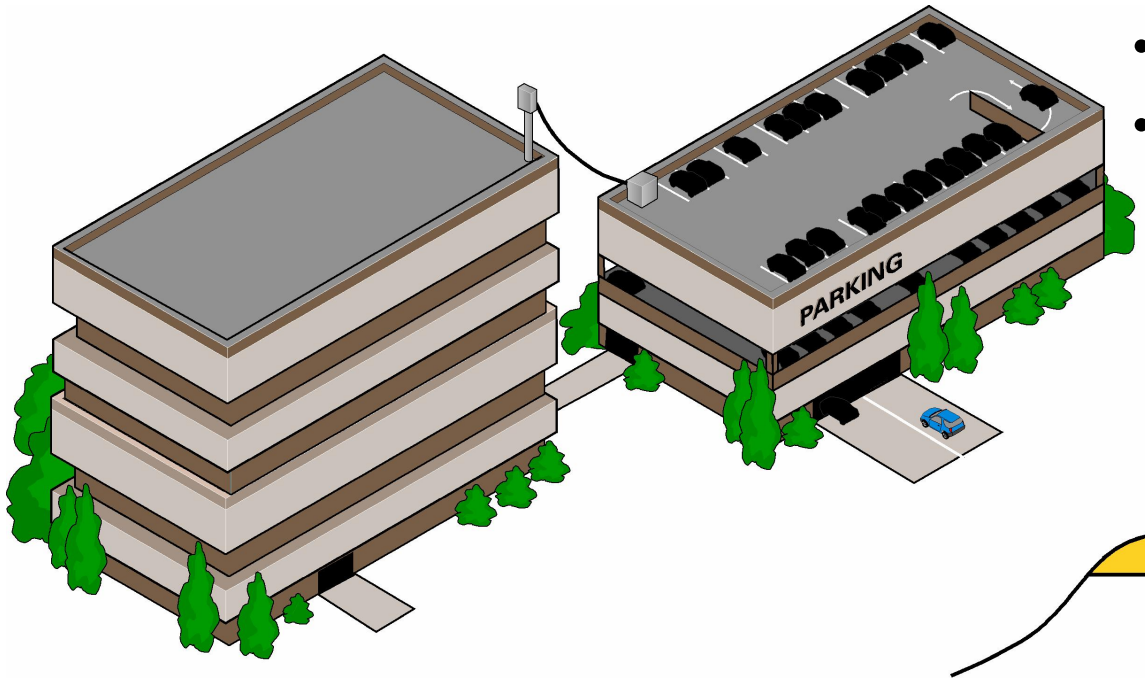
SCE's Vision- Future "Smart" Meters (AMI)

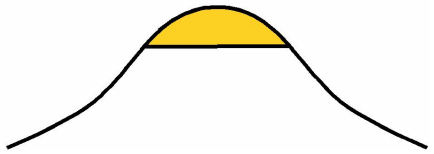
- Future transportation linkages to AMI enabling-
  - *Load management*
  - *Load shifting to off-peak*
  - *PHEV rate?*
  - *Peak shaving?*
  - *Road tax issues?*
  - *Off-peak rates?*



SCE Vision- Long Term Vehicle To Grid (V2G)

- "V2G" is attractive in theory
- Myriad of issues for utilities
- Unclear if feasible in practice
- Good long-term R&D area
- Some OEM interest





MY PHEV "Crystal Ball"

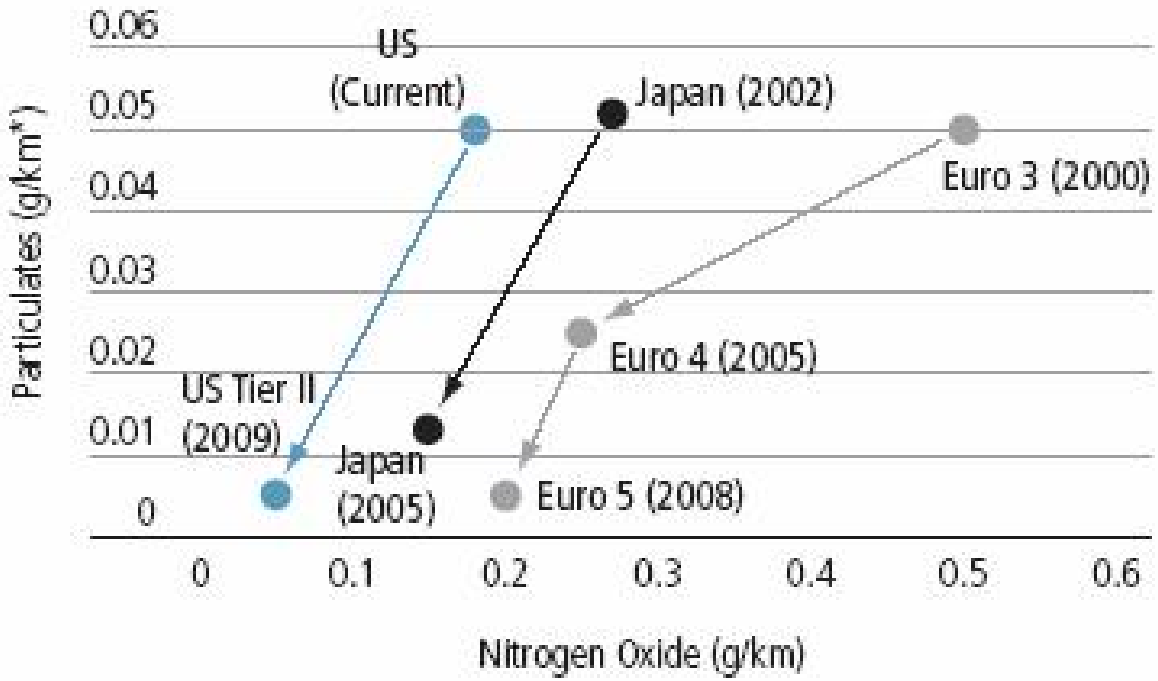
- Fuel Cells and Hydrogen proving a significant challenge and will take more time (cost, containment technology, range, infrastructure)
- Next 20 years "Hybridization" will dominate powertrain development
- Emergence of "Flex Fuel" Hybrids capitalizing on bio-fuels popularity
- Gasoline Hybrids will lead to PHEV (more MPG, cheaper domestic petroleum-free fuel, ubiquitous infrastructure)
- "Energy" battery costs will drop (vehicle volume, secondary use, stationary applications)
- Battery EVs will again have their day in the Sun!

Activists At Work

Diesel Has Challenges

Display 13

Diesels Will Soon Face Stricter Emissions Standards



*Grams per kilometer traveled

Source: WRI Capital Research, www.dieselnet.com and AllianceBernstein

"Electricity"- Pathway to Efficiency

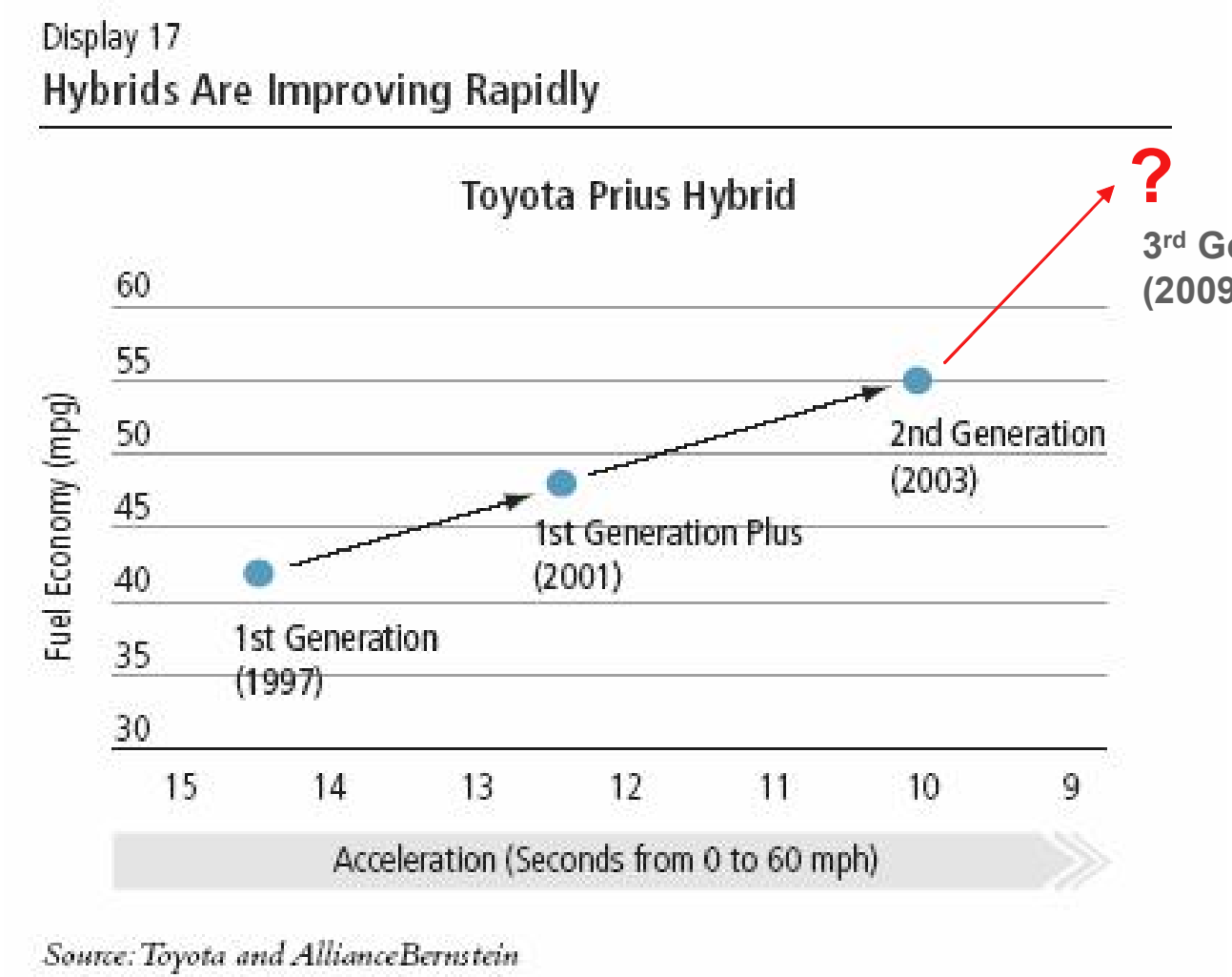
Display 15

Fuel Efficiency Rises with Ratio of Electric to Total Power

	Electric to Total Power	Fuel Economy Benefit	Representative Model
Conventional Vehicle	2%	Baseline	NA
Weak Hybrid	5–10%	5–20%	GMC Sierra
Mild Hybrid	10–30%	20–50%	Honda Civic Hybrid
Full Hybrid	30–50%	20–80%	Toyota Prius

Source: National Renewable Energy Laboratory, Dr. Menahem Anderman, Advanced Automotive Battery Conference (AABC), The New York Times, Car & Truck Test Monthly Buying Guide *and Alliance Bernstein*

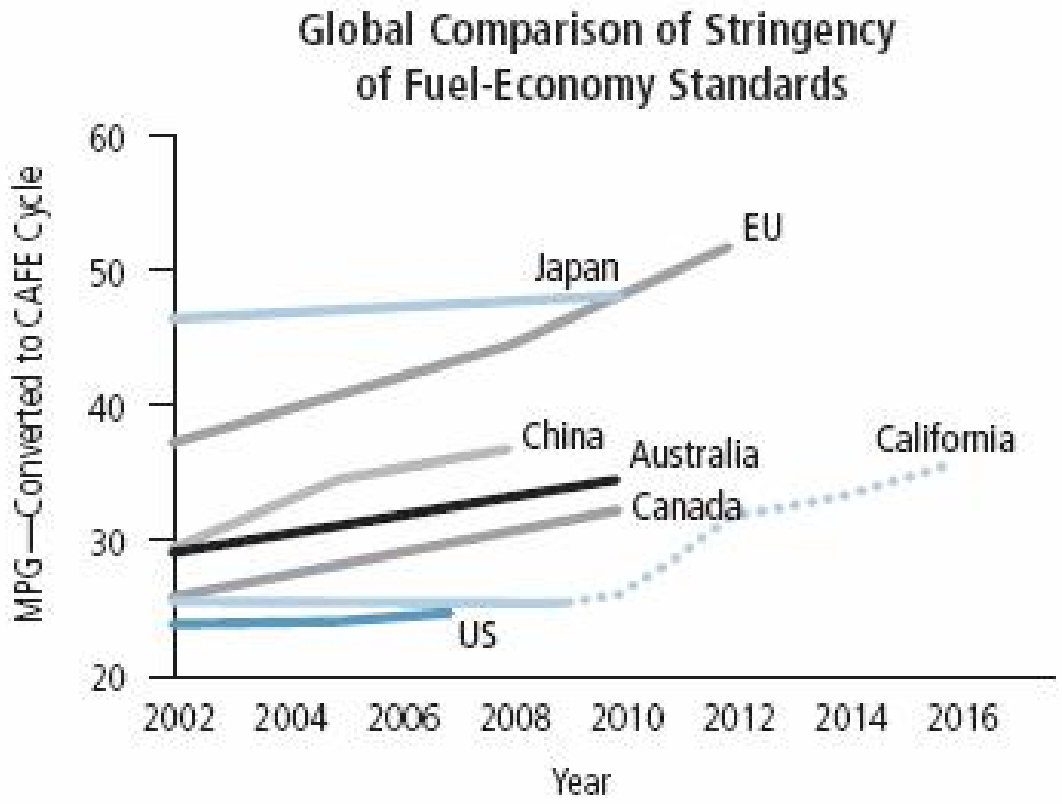
Next Generation Prius- With a Plug?



Our Fuel Economy- Not Good Enough

Display 21

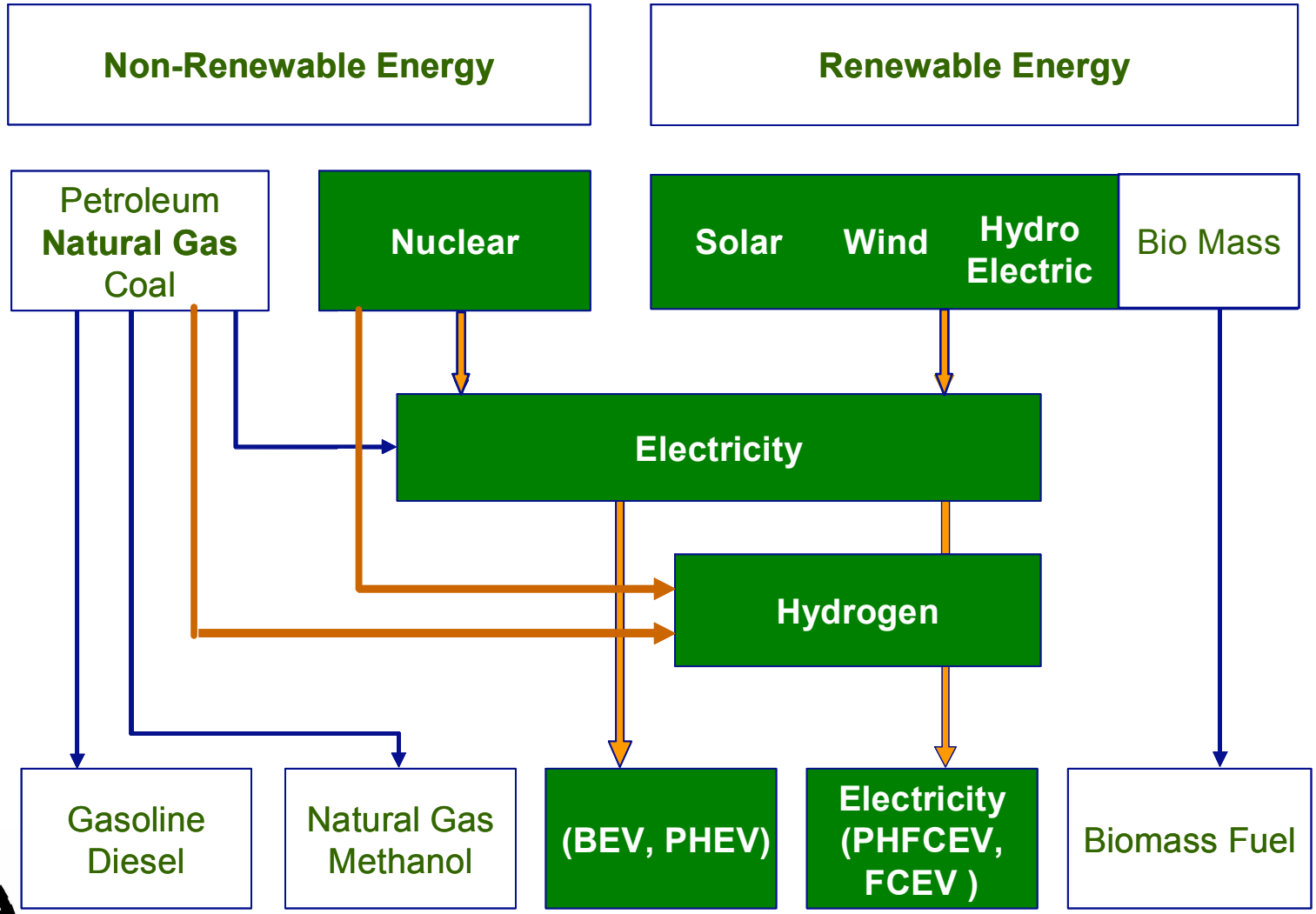
US Federal Fuel-Economy Standards Lag Far Behind



Source: Feng An, Pew Center for Global Change and WRI Capital Markets Research

The Tesla Beauty- More Than Skin Deep

Energy Choices for Transportation



SOUTHERN CALIFORNIA EDISON®
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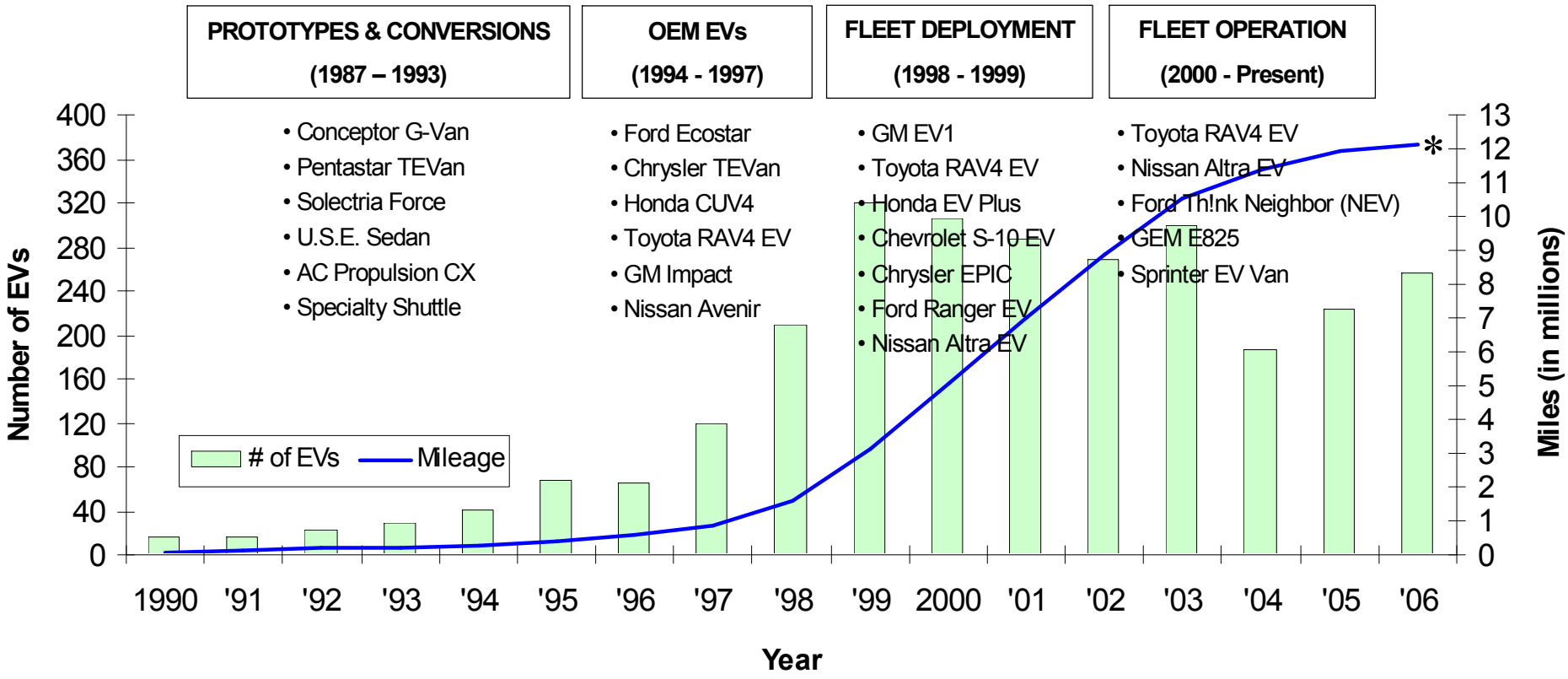
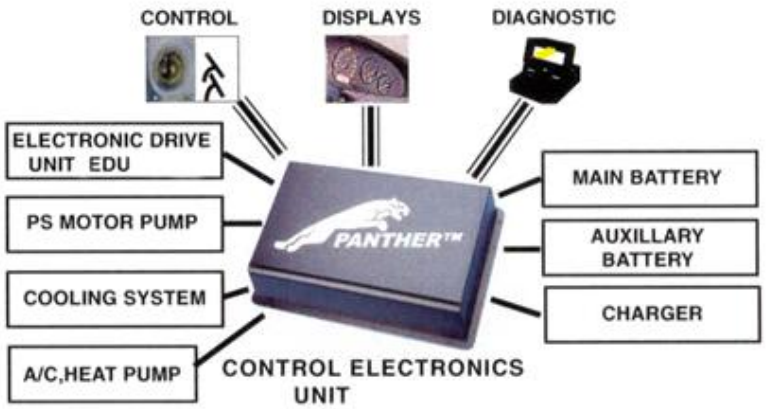
EVs at SCE Since 1990



* As of 04/30/06

Heavy Duty HEV Evaluation

- EVTC demonstrated the world's first PHEV utility troubleman truck
  - Project led to first commercial production effort (International/Eaton)
- ET/TSD facilities fully capable of heavy-duty testing and repair
- Complete heavy-duty hybrid vehicle evaluation procedures completed



SCE's Hybrid EV Fleet Programs

Heavy Duty

- Approximately 175 heavy duty trucks in SCE's fleet
- Fully electric arm-hydraulics and APU
- Low emissions and noise
- Eaton/International production version by 2007
- Bulk purchase program through consortium of utilities and Calstart

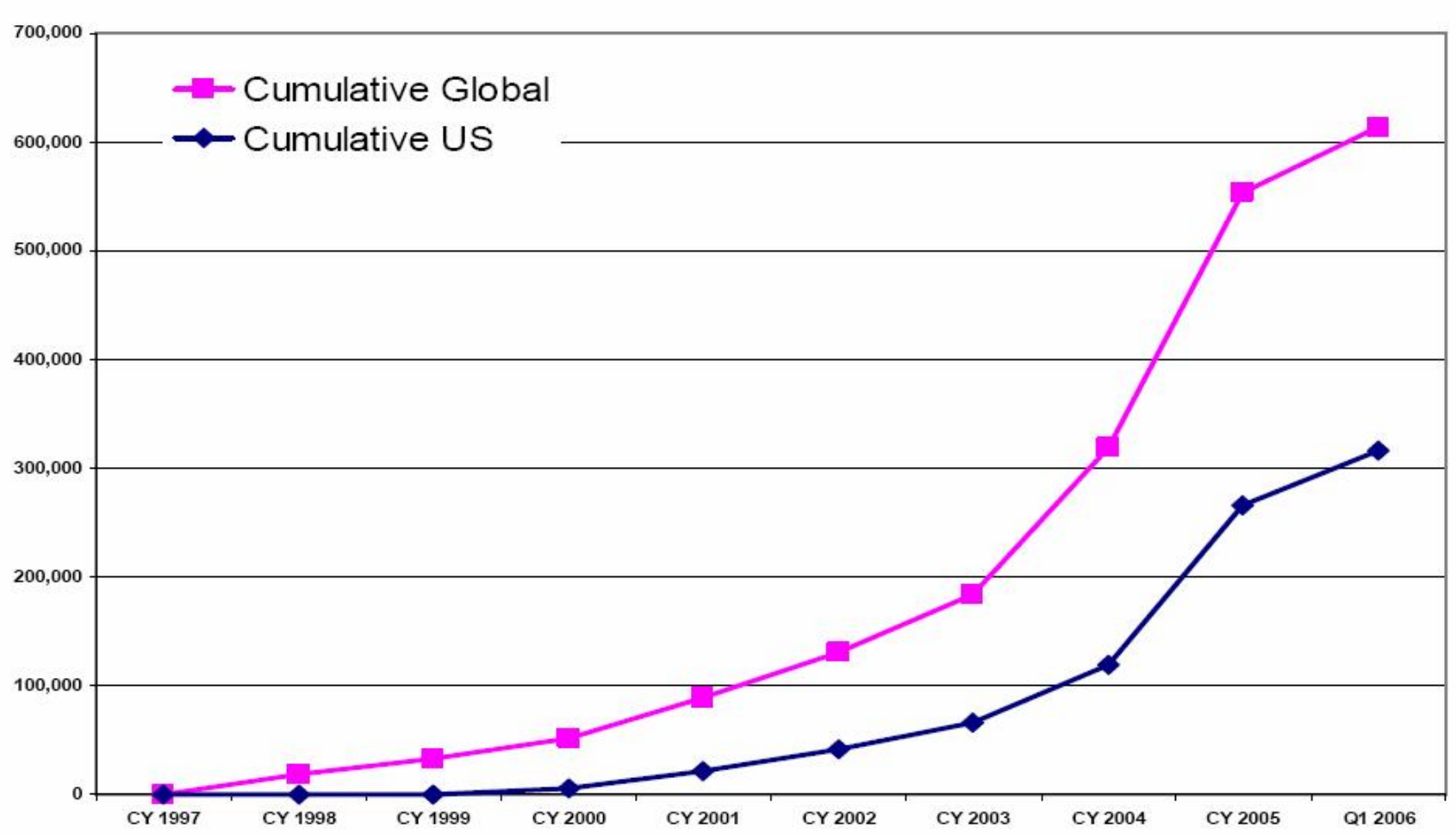
Medium Duty

- Approx. 425 medium duty trucks in SCE's fleet
- Stakeholders are beginning a MDV plug-in-hybrid program
- EPRI, SCE, PG&E and DWP and others

Light Duty

- 2600 LDVs in SCE's fleet
- 2005 Energy Bill allows hybrids to comply with EPAct fleet requirements

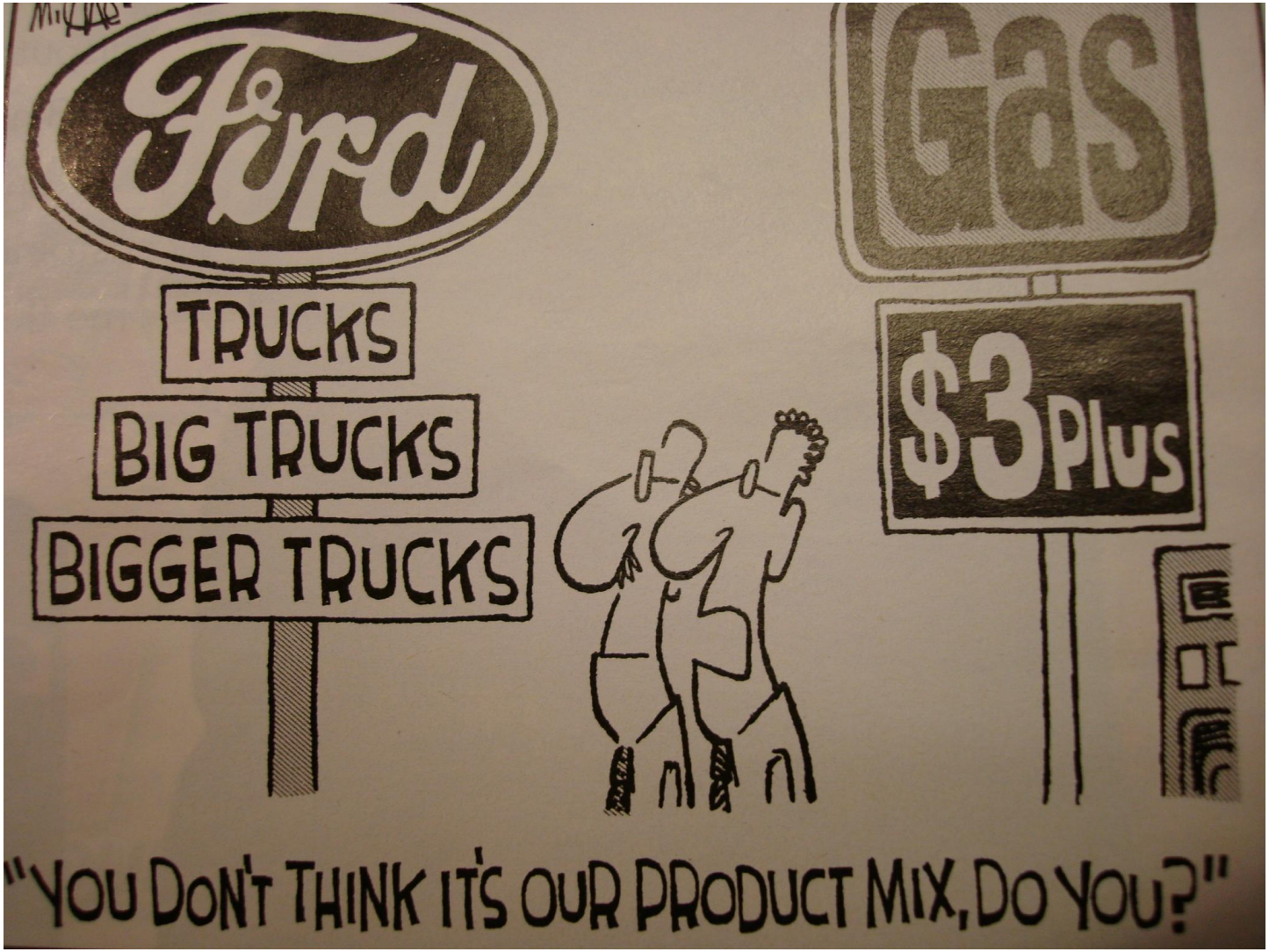
Trends- US Hybrid Sales



Source: Toyota

Trends- Toyota's Hybrids

Trends- The Domestic Autos Challenge



Trends- Trading “mpg” for “miles per minute” ?

Signs of consumer backlash to “muscle hybrids”?

Other PHEV Drivers

State

- Energy Action Plan
- Integrated Energy Policy Report
- Alt. Fuel plan
- New SCAQMD priority on PHEVs driven by SIP needs
- 3 recent Legislative hearings
- Potential Exec Order from Gov.

- Climate Change plan
- Zero Emission Vehicle mandate
- AB 1493 Pavley CO2 bill
- New PIER focus
- Two ballot measures in Nov.
  - *Public goods charge on oil*
  - *$19 billion bonds for Transport*

Federal

- President Bush focus on PHEVs in 10 recent speeches
- 2005/ 2006 Energy Policy Act
- US Advanced Battery Consortium
- Five hearings in Congress

- S. 2025 – 25 co-authors
- HR. 4409 – 65 co-authors
- DOE PHEV working group
- Several other Republican bills, e.g. Lugar, Domenici, etc

Important Websites

- www.calcars.org

- www.EDTA.org
- www.Pluginpartners.org
- www.sce/electrodrive.com

Conclusions

- Oil is driving our future…**to "avoid" it!**
- Energy Security plus Environment
- Energy Storage (batteries) is a nexus for mobile and stationary system "sustainability
- Hybridization is a nexus to all other "alternative" technologies
- PHEV and "flex-fuel" capability (bio-fuel)- a sustainable solution…today!

Conclusions

SCE recognizes the;

- critical need for the US to reduce it's imported oil dependence
- growing importance for transportation to reduce GHGs and emissions
- utility has a role to play as an alternative fuel provider

SCE believes grid electricity, the utility industry's existing infrastructure and it's excess off-peak capacity represents a critical national energy security asset

Thank You…